REMARKS

By this Amendment, claims 1-7, 9, 11, 29 and 30 are amended. In particular, claim 1 is amended to recite features supported in the specification at, for example, page 6 line 31 – page 7 line 7 (corresponding to paragraph [0040] of Publication 2005/0067072) and exemplified in FIG. 1, and claim 11 is amended to recite features supported in the specification at, for example, page 9 lines 15-21 (paragraph [0050] of the publication). Claims 2-7, 9, 29 and 30 are amended for grammar and clarity. Accordingly, claims 1-7, 9, 11, 12, 29 and 30 are pending in this application. No new matter is added by any of these amendments.

Reconsideration based on the following remarks is respectfully requested.

I. Amendment Entry After Final Rejection

Entry of this amendment is proper under 37 CFR §1.116 because the amendments: a) place the application in condition for allowance for all the reasons discussed herein; b) place the application in better condition for appeal if necessary; and c) address formal requirements of the Final Rejection and preceding Office Action. Accordingly, Applicant respectfully requests entry of this Amendment.

II. Claim Summary

As provided in independent claim 1 and schematically illustrated in FIG. 1, the metal foam forms a matrix (10) producing the void volume (12). The polymer that may contain metal particles (14) imbibes the void volume. See page 9 lines 1-3 (or published paragraph [0048]). Specifically, claim 1, as amended, recites a composite reactive material for ordnance that includes a metal foam having a void volume, a polymer imbibed into the void volume, and an additive material disposed within the polymer, with the additive material comprising at least one of finely divided metal particles and finely divided metal oxide particles, the metal foam being reactive with the polymer.

By contrast, reactive materials described in the prior art consisted largely of polymers and polymer mixtures. See the specification at page 2 lines 18-32 (paragraphs [0010] – [0012]).

However, polymers tend to deform under the influence of accelerative forces such as a propellant charge, rendering them unsuitable for ordnance that frequently depends on shape for damage effectiveness.

Dependent claim 2 further recites that the metal foam comprises a metal selected from the group consisting of molybdenum, osmium, titanium, boron, manganese, magnesium, aluminum, nickel, mixtures of the foregoing, and an alloy comprising at least one of molybdenum, osmium, titanium, boron, manganese, magnesium, aluminum, and nickel. Dependent claims 3 and 4 further specify that the metal foam comprises aluminum and essentially aluminum, respectively. Dependent claim 5 further recites that the metal foam is at least partially halogenated.

Dependent claim 6 further recites that the polymer is formed from one or more monomers selected from the group consisting of fluoroalkyl esters of acrylic acid, tetrafluoroethylene, chlorotrifluoroethylene, dichlorodifluoroethylene, hexafluoropropylene, vinyllidene dichloride, and vinylidene difluoride. Dependent claim 7 further provides that the metal foam comprises polytetrafluoroethylene. Dependent claim 9 further provides that the finely divided metal particles comprise aluminum. Dependent claim 11 further recites that the additive material produces a thermite mixture that includes aluminum particles and iron oxide particles.

Dependent claim 12 further provides ordnance comprising the above recited reactive material. Dependent claim 29 further recites that the material disposed within the polymer is selected to produce a thermite. Dependent claim 30 further provides that the metal foam consists essentially of aluminum, the polymer consists essentially of polytetrafluoroethylene, and the material disposed within the polymer comprises aluminum and iron oxide.

Applicant has invented a reactive material suitable for various uses that includes a foamed metal and a polymer, with the foamed metal and polymer being chemically reactive at under high stress, such as target impact. Particles of fine metal and/or metal oxide may be embedded in the polymer to moderate or augment the reaction of the reactive materials.

Alternatively, the foamed metal, polymer and added particles may be selected to produce a thermite mixture. Thus, the reactive material, as claimed, includes the metal foam, the polymer imbibed therein, and a particulate material that may be metal and/or metal oxide.

III. Indefiniteness Rejection under 35 U.S.C. §112, second paragraph

The Final Office Action rejects claims 1-7, 9, 11, 12, 29 and 30 under 35 U.S.C. §112, second paragraph for alleged indefiniteness. This rejection is respectfully traversed.

The Final Office Action asserts that the Markush group language contradicts subsequent thermite compositions. Applicant responds that claim 1 has been amended to obviate the indefiniteness rejection. This argument extends to dependent claims 2-7, 9, 11, 12, 29 and 30. Appellant respectfully requests withdrawal of the rejection under 35 U.S.C. §112, second paragraph.

IV. Anticipatory Rejection under 35 U.S.C. §102

The Final Office Action rejects claims 1, 2, 9, 11, 12 and 29 as being allegedlyanticipated under 35 U.S.C. §102(b) over U.S. Patent Application Publication 2001/0002297 to Schweizer *et al.* (hereinafter "Schweizer"). This rejection is respectfully traversed.

Applicant's claims are generally directed to a composite reactive material with structural reinforcement for military weaponry. The reactive material includes a metal foam having a void volume, a polymer imbibed into the void volume, and an additive material disposed within the polymer, with the metal foam being reactive with the polymer. The disposed material includes finely divided metal particles and/or finely divided metal oxide particles. Such features are described in the specification at, for example, page 5, line 10 – page 11, line 25 (published paragraphs [0031] – [0060]) and exemplified in FIG. 1.

Applicant respectfully asserts that Schweizer does not teach or suggest a composite reactive material for ordnance comprising a metal foam having a void volume; a polymer imbibed into the void volume; and an additive material disposed within the polymer, with the additive material comprising at least one of finely divided metal particles and finely divided metal oxide particles, the metal foam being reactive with the polymer, as recited in independent claim 1. These arguments also apply to claims 2, 9, 11, 12 and 29 based on their dependence from claim 1.

Further, Applicant asserts that Schweizer does not teach or suggest the metal foam as comprising a metal selected from the group consisting of molybdenum, osmium, titanium, boron, manganese, magnesium, aluminum, nickel, mixtures of the foregoing, and an alloy comprising at

least one of the aforementioned metals, as provided in dependent claim 2. Additionally, Schweizer fails to teach that the additive material produces a thermite of aluminum particles and iron oxide particles, as recited in claim 11. Also, Schweizer does not teach or suggest ordnance from the above-described reactive material as expressed in claim 12.

As explained in the specification at page 4 lines 22-24 (paragraph [0025]), each component of Applicant's reactive material need not be reactive alone. The components together, however, react with each other under the appropriate conditions. Even if the selected metal foam is not a reactive material by itself, it can chemically react when combined with the selected polymer and subject to high stress, as described at page 3 lines 22-24 (paragraph [0016]). Such a material becomes reactive when the polymer is imbibed therein. The particulate material component, as set forth above, alters or enhances or adds to the reactive reaction.

Instead, Schweizer discloses a data carrier (*i.e.*, recording medium) having a pyrotechnic layer for commanded destruction. In particular, Schweizer teaches a data storage disk, *e.g.*, CD-ROM (1), having a data carrier portion (2) with the pyrotechnic layer (4) adhered thereon. See, *e.g.*, paragraph [0034] and Fig. 1 of Schweizer. The pyrotechnic layer (4) comprises a pyrotechnic material incorporated into an inert substrate or buffer, such as a metal foam structure (44) for thermal energy absorption. See, *e.g.*, paragraphs [0006], [0014] and [0065] and Fig. 2e of Schweizer.

In contrast to Applicant's claimed features of a reactive material for ordnance, Schweizer requires that the metal foam component must be chemically inert with respect to the pyrotechnic material to preclude exothermic heat generation. Moreover, Schweizer defines "inert" in paragraph [0007] as making "no or only a relatively small contribution" during combustion of the pyrotechnic layer, citing nickel in paragraph [0016] for exemplary non-reactivity in high temperature combustion. Schweizer's claims reciting "a pyrotechnic material associated with an inert material substrate carrier" (claim 1) and "the inert material substrate carrier... formed from an inert metal..." (claim 5) further emphasizes these teachings. Consequently, Schweizer fails to teach at least that the metal foam is a component of the reactive material and reacts with the polymer imbibed therein.

For at least these reasons, Applicant respectfully submits that independent claim 1 is patentable over the applied reference. The dependent claims 2, 9, 11, 12 and 29 are likewise patentable over the applied reference for at least the reasons discussed, as well as for the additional features they recite. Withdrawal of the rejection under §102 is respectfully requested.

V. Obviousness Rejections under 35 U.S.C. §103

The Final Office Action further rejects claims 3 and 4 as being allegedly unpatentable under 35 U.S.C. §103(a) over Schweizer in view of U.S. Patent 3,834,881 to Niebylski; claims 5-7 as being allegedly unpatentable under 35 U.S.C. §103(a) over Schweizer in view of U.S. Patent 3,309,249 to Allen; and claim 30 as being allegedly unpatentable under 35 U.S.C. §103(a) over Schweizer in view of Allen and further in view of Niebylski. These rejections are respectfully traversed.

Neither Niebylski nor Allen compensates for the deficiencies of Schweizer outlined above for claim 1. Moreover, Niebylski fails to teach, disclose or suggest the additional features recited in claims 3 and 4 regarding the metal foam that comprises aluminum and essentially aluminum, respectively, in context of a polymer. Also, Allen fails to teach, disclose or suggest the additional features provided in claims 5-7 reciting that the metal foam is at least partially halogenated; the polymer is formed from at least one monomer selected from the group consisting of fluoroalkyl esters of acrylic acid, tetrafluoroethylene, chlorotrifluoroethylene, dichlorodifluoroethylene, hexafluoropropylene, vinylidene dichloride, and vinylidene difluoride; and the polymer comprises polytetrafluoroethylene, respectively.

Instead, Niebylski discloses a laminate structure that includes a foam metal sandwiched between sheet materials. In particular, Niebylski teaches the metal (*e.g.*, aluminum) foam as resistant to shear and compression, with the sheet materials serving to distribute the imposed load. See *e.g.*, col. 1 lines 30-63 and col. 2 lines 44-55 of Niebylski.

In the absence of any reference to a material that fills the voids in the foam metal, Niebylski provides no teaching or suggestion for a reactive composite, particularly for use in ordnance. Thus, an artisan of ordinary skill would not have been motivated to incorporate an aluminum foam structure from Niebylski into a pyrotechnic layer from Schweizer absent hindsight from Applicant's disclosure. Rather, by recommending aluminum, Niebylski provides a

material that is reactive in the presence of an imbibed polymer, thereby teaching away from Schweizer's requirement of an inert metal foam.

Further, Allen discloses a solid fuel for a hybrid rocket. In particular, Allen teaches incorporating exothermic particles in a solid propellant composition. See *e.g.*, col. 1 line 56 – col. 2 line 16 of Allen. Although Allen teaches resin binders, these do not include polymer materials recited in claims 6 and 7. Moreover, there is no teaching or suggestion in Allen for halogenated metal foam, as recited in claim 5. Also, the ordinary artisan would discern no reason to combine the propellant formula of Allen with the destructable memory medium of Schweizer, as the applied references address unrelated solutions to entirely separate problems.

In addition, the combination of Schweizer, Niebylski and Allen fails to teach or suggest the features of dependent claim 30 that recites the metal foam consisting essentially of aluminum, the polymer consisting essentially of polytetrafluoroethylene, and that the material disposed within the polymer comprises aluminum and iron oxide. Also, Applicant respectfully asserts that one of ordinary skill in the art would lack any motivation to combine these applied references due to the absence of any mutually common teachings in materials, much less for addressing the advantages provided in the recited claims.

A *prima facie* case of obviousness for a §103 rejection requires satisfaction of three basic criteria: there must be some suggestion or motivation either in the references or knowledge generally available to modify the references or combine reference teachings, a reasonable expectation of success, and the references must teach or suggest all the claim limitations. See MPEP §706.02(j). Applicant submits that the Final Office Action fails to satisfy any of these requirements with Schweizer, Niebylski and/or Allen regarding claims 3-7 and 30.

For at least these reasons, Applicant respectfully asserts that dependent claims 3-7 and 30 are patentable over the applied references. Consequently, all the claims are in condition for allowance. Thus, Applicant respectfully requests that the rejections under 35 U.S.C. §103 be withdrawn.

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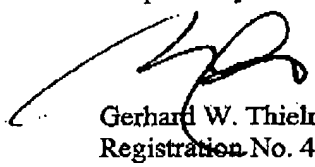
VI. Conclusion

In view of the foregoing amendments and remarks, Applicant respectfully submits that this application is in condition for allowance. Favorable reconsideration and prompt allowance are earnestly solicited.

Should the Examiner believe that anything further is desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact Applicant's undersigned representative at the telephone number listed below.

Respectfully submitted,



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